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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|--|-------------|----------------------|---------------------|------------------|
| 10/044,017 | 01/10/2002 | Marko Loncar | Q136 | 8172 |
| 7590 02/27/2004 | | | EXAMINER | |
| Daniel L. Dawes Myers, Dawes & Andras LLP 19900 MacArthur Blvd, Ste 1150 Irvine, CA 92612 | | | PAK, SUNG H | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 2874 | |

DATE MAILED: 02/27/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | | |
|------------------------------|--------------------------------------|--------------------------------------|--|
| Office Action Summary | Application No. 10/044,017 | Applicant(s) LONCAR ET AL. | |
| | Examiner Sung H. Pak | Art Unit 2874 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 November 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-26 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07 June 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Applicants' amendment filed 11/12/2003 has been entered, and all the pending claims have been carefully reconsidered. Applicants' arguments regarding the patentability of pending claims have been carefully studied by the examiner, however, they are not convincing. Therefore, the previous ground of rejection is upheld by the examiner in this office action. Please refer to Remarks for further discussion.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-4, 8-9, 13-17, 20-22, 26 are rejected under 35 U.S.C. 102(e) as being anticipated by Kurosawa (US 6,134,369) as discussed in the prior office action.

Kurosawa reference discloses an optical device with all the limitations set forth in the claims, including: a planar photonic crystal slab in which an array of holes is defined (Fig. 2); a waveguide defined by a line defect defined in the slab (Fig. 3); the line defect created by a geometric perturbation of at least a first set of holes with respect to a second set of holes to create at least one guided mode of light propagation in the

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waveguide which exhibits reduced vertical and lateral losses (abstract); increased coupling of light into the slab (abstract); the geometric perturbation being a positional displacement of the first set of holes with respect to the second set of holes in a predetermined direction (Fig. 2-3); the first and second set of holes having same diameters (Fig. 2).

Claims 1, 10-12, 14, 23-25 are rejected under 35 U.S.C. 102(e) as being anticipated by Cotteverte et al (US 2002/0048422 A1).

Correverte et al reference discloses an optical device with all the limitations set forth in the claims, including: a planar photonic crystal slab in which an array of holes is defined (Fig. 21); a waveguide defined by a line defect defined in the slab, the line defect being created by a geometric perturbation of at least a first set of holes with respect to a second set of holes to create at least one guided mode of light propagation in the waveguide which exhibit reduce vertical and lateral losses, increased coupling of light into the slab, and closer matching of frequencies of eigen modes of the optical device coupled to the waveguide (paragraph 0019-0025); the geometric perturbation being created by increasing or decreasing the diameter of the first set of holes in the array relative to the second set of holes comprising the remainder of the array (Fig. 21, 25I).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 5-7, 18-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kurosawa (US 6,134,369).

Kurosawa discloses an optical device with all the limitations set forth in the claims as discussed above, except it does not explicitly specify positional displacement values. However, it is well known in the art to determine optimal positional displacement values for guiding light signals with minimal optical loss. Therefore, it would have been obvious to a person of ordinary skill in the art to arrange the set of holes in Kurosawa device to reflect optimal positional displacement values. It would be

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desirable to have an optical device with a minimal optical loss.

Remarks

Claims 1-4, 8-9, 13-17, 20-22, 26 rejected under 35 U.S.C. 102(e):

Starting on page 8 and on to the top of page 9 of the applicants' response, it is argued that Kurosawa reference does not disclose a waveguide "defined by a line defect defined in the array of holes in the slab as required by the claim." Further it is argued that Kurosawa, instead, discloses a waveguide defined by a "pair of opposing slots," and that "Only the bend in the waveguide has any partial array of holes..."

The examiner respectfully points out that while it is true that Kurosawa reference does disclose a waveguide structure defined by a pair of opposing slots, it *also discloses a waveguide bound by array of holes* (Figs. 2,3,4,5). Although the applicants characterize these holes as "partial array of holes" they are, nevertheless, *array of holes*. And, Kurosawa reference does disclose a waveguide structure bound by array of holes. Therefore, the limitations, as recited by the claims as written, are anticipated by the Kurosawa reference.

Also, the examiner respectfully points out that the applicant's own disclosure states,

"by omitting one row of holes 12 [in figure 1] we are adding more high refractive index material and therefore frequencies of some modes from the air band are reduced and they are pulled down into the bandgap, to form localized defect states. This type of waveguides, where we increase the amount of high dielectric material comparing to the *unperturbed* planar photonic crystal, will be called a donor-type waveguide." [emphasis added]

(page 12 lines 1-6)

Thus, the applicant discloses that omitting the holes so that more high refractive index material occupies the waveguiding portion constitutes “perturbing” planar photonic crystal. Analogously, the Kurosawa reference discloses a waveguide comprising high refractive index material bound by array of holes on either side of the waveguiding portion (Fig. 4-5). Such line defect in array of holes constitutes geometric perturbation of one set of holes on one side of the waveguiding portion, relative to the other set of holes on the other side of the waveguiding portion.

The examiner respectfully points out that even though the Kurosawa reference does not explicitly use the words “geometric perturbation”, the claimed limitations are fully anticipated as discussed above. In addition, the optical transmission characteristics resulting from the photonic crystal waveguide structure as claimed, such as low vertical and lateral losses and increased coupling of light are inherent in the Kurosawa device since the reference anticipates all the structural limitations of the claimed invention.

Claims 1, 10-12, 14, 23-25 rejected under 35 U.S.C. 102(e):

Starting on page 10 of the applicants’ response, it is argued that Cotteverte reference does not disclose “the creation of line defect... by a geometric perturbation of two sets of holes in the array.”

As discussed above, the examiner respectfully points out that Cotteverte, like Kurosawa, does disclose a waveguide structure comprising a high refractive index

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material bound by arrays of holes on either sides of the waveguide portion, which constitutes “perturbation” of array of holes by virtue of having more high refractive index material in the waveguide portion. Thus, the “nature of the line defect” is implicitly disclosed in the disclosure of the reference. Since the Cotteverte reference discloses such a structure, the claimed limitations are fully anticipated by Cotteverte reference.

Claims 5-7, 18-19 rejected under 35 U.S.C. 103(a):

Starting on page 12 of the applicants’ response, it is argued that it would not have been obvious to a person of ordinary skill in the art to arrange the set of holes in Kurosawa device to reflect optimal positional displacement values, since “Kurosawa does not disclose an optical device with all the limitations set forth in the claims 1 and 14.”

As discussed above, since Kurosawa reference does disclose all the claimed limitations of claims 1 and 14, this ground of rejection is maintained by the examiner.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

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shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sung H. Pak whose telephone number is (571) 272-2353. The examiner can normally be reached on Monday - Thursday : 6:30am-5:00pm.

The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Sung H. Pak
Examiner
Art Unit 2874

sp


**HEMANG SANGHAVI
PRIMARY EXAMINER**